



This wooden mockup of the Mohawk, built during the Summer of 1957, has the original T tail configuration, snow skis, 150 gallon drop tank, and proposed armament pylons. (Grumman)

THE OV-1 MOHAWK, THE EARLY DAYS

Although much has been documented about the OV-1 Mohawk from an operational perspective, there is essentially no written record pertaining to the program during the development, and early production phase.

As one who was involved with the U.S. Army portion of the program from its inception, I may be able to fill in some gaps that form a portion of the total fabric of a great air plane.

It must be kept in mind that over 40 years have elapsed since the program beginning so that ones mind may be cloudy about the accuracy of some specific dates and/or events. However there should be sufficient factual information to prevent this from reading like a cheap novel.

THE BEGINNING

During the years of WW-II and Korea, both the Army and Marine Corps relied on old tired Liaison aircraft such as the Piper L-4, and the Stinson L-5. Although these aircraft served well, they had only a day VFR capability, had a limited operational range, and had no crew protective armor. Further they did not have the capability to deliver ordinance on targets either for target marking or support of ground personnel. Granted the initiative of some crews led to the installation of small wing pod mounted machine guns and Bazooka rockets, however these were more for looks than real effectiveness.

In the spring of 1956, the Marine Corps, through the Navy Bureau of Aeronautics, (BuEar) developed a Detail Design Specification for a new observation aircraft. The specs, in general, were as follows;

- 1-A/C to be twin engine, preferably turbo-prop, and must have good slow speed single engine handling qualities.
- 2-Provide armor for crew protection
- 3-Day-Night VFR capability
- 4-Low speed handling capability to allow rough field and aircraft carrier take-off and landings
- 5-Design to include weight, space and power provisions within the fuselage for the installation of aerial photo equipment such as the KA-50 aerial camera and night illumination flares.
- 6-A/C must be capable of accurately delivering marking rockets or other ordinance deemed appropriate by the operator.
- 7-Flight crew must have capability of safe in-flight egress.
- 8-All design details were to be in accordance with applicable MilSpecs.

The design specification was distributed to industry in the fall of 1956. It is unknown by me who the competing companies were or the method of selection. However on the late fall of

3/1964 THE EARLY YEARS

1956, the Bureau of Aeronautics and the Marines approached the U.S. Army with a suggestion that the Army participate in the development program on a joint cost sharing basis. Because the development costs were rather extensive by Army standards, it took some doing to convince the Aviation Budget group to fund the program. It must be kept in mind that this was the first MIL-SPEC Aircraft that the Army was involved in. All previous procurement's had been essentially commercial off-the-shelf buys. Only minor low cost modifications were authorized as the A/C were FAA Certified. Meeting MIL-SPECS is a costly and time consuming process but provides a better military product.

THE DEVELOPMENT PROGRAM

The development contract was awarded to Grumman Aircraft Co. of BethPage N.Y. The A/C was designated the YAO-1. The Mohawk name and OV-1 designation came later. The Grumman design included a twin engine turbo-prop powered mid-wing tricycle gear A/C with Martin Baker zero altitude 80 kt ejection seats, crew protection armor, wing leading high lift slats, speed brakes, self sealing fuel cells and an arresting hook to facilitate carrier landings. The original tailplane configuration consisted of a single vertical fin and rudder with a high "T" tail horizontal stabilizer. There were two sets of ailerons (In board and outboard). The purpose of the dual ailerons was to enhance low speed single engine roll characteristics.

Early wind tunnel testing of a $\frac{1}{4}$ scale model revealed that the single vertical tail configuration was not adequate to provide satisfactory low speed single engine control. The wind tunnel model tail was changed to a two rudder or "H" tail configuration. This configuration was also not satisfactory. The final and satisfactory design was a triple vertical fin/rudder configuration.

A point of interest is that Grumman actually fabricated a "Full Size" wooden mock-up of the A/C which had the high "T" tail configuration. This mock-up was placed on display in Washington D.C. during the 1957 Association of the U.S. Army (AUSA) National Convention. That display had prompted many persons over the years to believe that such a design configuration was actually produced, which was not the case.

As the program progressed, it became apparent that a full time Army representative was required to be on site with the Navy and Marine development group in BuAer. This agency was located in the Main Navy Bldg. on Constitution Ave. in Washington. Because I had been working on the program from the time the Army became involved, I was assigned to BuAer in the Transport Design Division (the department assigned the YAO-1 development).

I moved from the Engineering & Development Branch, Army Aviation Division, Office Chief of Transportation located in Bldg. T-7 in Washington. Over the next several years, our group grew to a staff of five (5) as we also picked up the Army portion of the H-34 and H-37 development and procurement programs.

As the differences between the Army and Marine design and operational requirements were resolved, some design changes were made. The Marines deleted the requirement for a tail hook but the Army insisted on an "All Weather" capability. As a result, anti-icing and de-icing devices were added on later production A/C. There were also major differences in the electronics and avionics packages required by each service. These were to be resolved by production block numbers of A/C.

INITIAL CONTRACTOR FLIGHT TEST PROGRAM

The contractors initial flight test program progressed quite well with a minimum of major problems. The original design had micro switches installed on the landing gear to prevent the use of reverse thrust until the full weight of the A/C was on the gear. Because of the wing high lift devices it was not possible to go into reverse until the A/C would have slowed to a point that reverse was ineffective. As a result the restrictive micro-switch design arrangement was deleted.

The contractor flight envelop expanded and air speeds increased toward Vne (450Kts). At least one major problem developed that nearly proved fatal. During a high speed dive which was intended to check for flight control surface flutter, the center rudder developed an uncontrollable flutter. Before airspeed could be reduced to eliminate the problem, the center rudder and part of the vertical fin were ripped from the A/C carrying with it the elevator bell crank. This caused the A/C to pitch up so violently that the Grumman test pilot (the late Dixie Donnell) blacked out. When he regained his senses, the A/C had assumed a nearly vertical nose up attitude and was nearing a stall. The chase plane pilot advised the test pilot to eject. However, Dixie found that he could control pitch attitude with the elevator trim tab wheel and directional control with differential power. He elected to fly the A/C back to the test facility and to attempt a landing. His skills paid off. The A/C was landed safely with no further damage. A detailed examination of the A/C revealed that the G-meter was pegged at 9-Gs. The only damage inflicted to the air frame (other than the rudder failure), was a slight distortion of one of the engine mounts. Thank goodness for the Grumman Iron Works. The rudder vertical/fin mating surfaces were re-designed and the problem solved.

During the Navy validation testing of one of the YAO-1 aircraft at the Patuxent River test site, two Navy test pilots, while accomplishing a short field landing over a row of trees, placed the power levers in reverse at approximately 50ft in the air causing the A/C to pick-up such a high rate of decent that upon impact with the ground, the fuselage failed just aft of the fuel cell area. Both pilots sustained back injuries but no broken bones. The A/C was scrapped.

ARMY/NAVY CONTRACT CONFLICTS

In the fall of 1957, near the end of the fiscal year, I was called to the office of Admiral Coats, the Deputy Chief of BuAer. I was advised that because of major BuAer budget cuts, it was necessary for the YAO-1 program to be dropped from the Navy/Marine budget. Further, if the Army still wanted the A/C, it would have to fund the program alone. However the Navy would continue to manage it as it was a Navy contract and Grumman was a Navy supported plant.

The Army had no choice but to continue the program because there were no viable timely alternatives.

NOW AN ARMY SHOW

Meetings with the major contractors resulted in significant changes to cockpit instrumentation, avionics and electronics. Essentially all specific Marine configuration requirements were deleted. The Signal Corps attempted to take over the program in order to make the A/C an electronics platform. There was even the suggestion by a senior NON-AVIATOR Signal Corps type that the ejection seats be eliminated to save weight so that more electronic equipment could be installed. The proposal was rejected without discussion.

As the development testing wrapped up in 1958, production contracts were awarded through the Navy for the Army version which was designated the AO-1 Mohawk (Later designated the OV-1). Plans were initiated to develop IR and SLAR equipment which would be compatible with the existing airframe and gross weight limitations. The Army Combat Surveillance Agency was continuing to propose the addition of more and more equipment. These changes resulted in a serious potential degrading of the A/C performance. As a result, Grumman was directed to initiate design changes which would at least prevent further performance reduction. Out of this effort came the increased wing span and up-rated turbo-prop engines.

I left the program in June 1959 in order to attend the Transportation School Officers Course. This was followed by a one year (1960) tour in Korea. I returned to the program in January 1961 when I was assigned to the Transportation Test & Support Activity (TATSA) (later to be merged with the Aviation Test Board) where I was assigned as OV-1 Project Officer/ Project Pilot.

PRODUCTION FIELDING

In early 1960, the first U.S. Army Training Center pilots were sent to Grumman for a factory check-out and to deliver the initial production A/C to Fort Rucker for the initiation of the OV-1 training program. This is a separate story in it self.

FOLLOW-ON SPECIAL PROGRAMS

IN-FLIGHT REFUELING

By 1961, the OV-1 Mohawk aircraft, electronics and weapons systems had matured to the point that it was time to look at special applications. One of the interesting thoughts was to extend the range of the aircraft by the use of an In-flight refueling system. This involved the installation of a refueling boom on the aircraft with related plumbing. The Probe and Drogue System was selected. This system was much less complicated than the Flying Boom concept. Also the Probe and Drogue System was generally used by the Navy which supported our plan while the Flying Boom System was operated by the Air Force which was not very happy to see the Army get into the long range flying business, even to ferry aircraft.

One OV-1A was fitted with a 12ft long boom and was flown behind a Marine C-130 in order to validate the feasibility of the concept. Everything went well and those of us who flew it found it quite easy to capture the drogue basket and to take on fuel. In-fact if one was very skillful with power management it was actually possible to slowly reduce power on the OV-1 to the point that the A/C was being towed by the C-130 tanker.

Following the successful concept testing, we very quietly developed a plan to make a Very Long Range ferry flight using the In-Flight refueling system. It was a simple plan. In order to validate the test results, a non-stop flight would be made from New York to San Francisco with in-flight refueling. Assuming a successful trip, after necessary rest, we would continue on to Hawaii. The return would be a 16/18 hour flight non-stop Hawaii to Davison Army Air Field, Fort Belvoir Va. with as many as five (5) enroute in-flight refuelings.

The test aircraft received special TLC from the airframe and engine manufacturer, all navigation equipment calibrated and the flight was a go until the Air Force got wind of the plan. All it took was a call from the A.F. Chief of Staff to the Army Chief of Staff to kill the project. A real shame. The refueling system was removed from the A/C and the project scrapped.

WEST GERMAN, FRENCH & JAPANESE OV-1 EVALUATION PROGRAMS

GERMAN ARMY EVALUATION

In the summer of 1963 the Federal Republic Of Germany (FRG) expressed an interest in the OV-1B and OV-1C versions for the German Army and requested several A/C for evaluation. The Dept. of Army proposed to the FRG that the Mohawk Project Managers Office within the Army Material Command (AMC) organize and staff a team, consisting of three (3) pilots including myself, Major James (Jim) R. Barkley (Mohawk Program Managers Office, the TC team chief), Capt. George Makula (Signal Corps) and Capt. William (Bill) Simpson (TC), supported by several military technicians, and contractor field service representatives. A major(non-aviator rated) from the Army Security Agency (ASA) was also assigned. The team was attached to the FRG and would provide all support and fly all missions for the German Government evaluation.

In early September 1963, we arrived at the German Army Flying School (fliegewffeschule) located at Buckeburg Germany with two new A/C (an OV-1B and an OV-1C) and lots of special support material. Because of the nature of the program, all U.S. markings were removed from the A/C and replaced with the German Iron Cross on the wings and fuselage and with German identification. The B-model was designated Alpha Bravo Quebec and the C-model was Alpha Bravo Whiskey.

As it turned out, the project was more than a routine evaluation. With the B-Model SLAR System, our missions (evaluation flights) were usually flown late at night (usually by Capt.s Mikula and Simpson) along the east/west German border all the way to the north sea. All information or SLAR film gathered during each flight was removed from the system as soon as the mission was completed and was taken over by a American/German intelligence group. The C-Model was used for night photo and simulated IR missions on the West German side of the border but in somer selected classified areas. On one mission, they detected a "foreign" submarine on the surface in a location where it should not have been. That tends to tell you something.

Concurrent with the initiation of the FRG evaluation, and at the suggestion of the U.S. Army, two (2) well qualified German Army pilots were sent to Fort Rucker, to attend OV-1 Mohawk transition. I do not remember the names of either of the pilots,

Although I had met both of them prior to their departure for Fort Rucker. As I understood it, they did very well in OV-1 training and were looking forward to returning to Buckeburg and participating in the OV-1 evaluation. Then tragedy struck.

A part of their training included night photo missions using illumination flares fired from pods mounted on the upper wing surface but butting up against the fuselage next to the main fuel cell. During a night photo training mission, a flare was fired but hung up in the flare cluster box and ignited. The resulting explosion destroyed the A/C. The I.P. Safely ejected but the German student did not survive. The explosion apparently prevented him from ejecting.

As a subsequent investigation revealed, the problem was not in the flare dispensing system but rather in the way that the flares themselves were manufactured. We on the evaluation team were using the same flares but were never told of the possible explosion hazard until the manufacturer advised that those particular type flares should not be used in aircraft applications. The outer packaging sleeve was of a cardboard material which could swell with age, preventing the actual flare from leaving the dispenser. Thus an explosion could occur in the dispenser. This could result in the sympathetic detonation of all of the remaining flares in the as was the case at Fort Rucker. The problem was solved when the manufacturer went to a metal sleeve and this design was released for general aircraft use.

This tragedy may well have had a negative affect on the final German government decision relative to the possible procurement decision. However, I believe that the accident only helped support the German Air Force negative position.

The evaluation program was completed in late October, 1963. The bottom line was that although the German Army truly wanted the A/C, the German Air Force which procured A/C for the army, was not in favor of letting them have that kind of capability. So the Army lost. It sounds like the old U.S. Army aviation days of 1946/50 when the U.S. Air Force procured our A/C.

FRENCH MILITARY EVALUATION

Just as we were preparing to return to the states, the State Department received a request for an OV-1 evaluation by the French Air Force. So we diverted to France. Enroute to a French Air Force base in Metz France, we were directed to a U.S. Army aircraft maintenance facility in Sandhofan Germany where all German markings were removed from the aircraft. They were replaced with the French Tri-Color identification.

Upon arrival at Metz it became apparent from the proposed mission plans that the French did not have any real interest in the A/C. But because the Germans had conducted an evaluation they did not want to be left out in the cold. We only flew day VFR unclassified missions. Their evaluators showed little interest in the results of the SLAR or IR data. This evaluation was concluded in early December 1963 and the team returned to their respective units in the states.

JAPANESE GOVERNMENT EVALUATION

In the early spring of 1964, the Japanese government indicated an interest in the OV-1 platform or some special requirements. Again I was picked to be the demonstration pilot. This time I was directed to proceed from my duty station in HQ, AMC to Eighth Army Hq's in Korea. There I was to pickup an OV-1A from the Mohawk unit located at K-16. Then fly to Chofu Japan (near Tokyo) where the Japanese would conduct a two week evaluation. After several weeks of flight demonstrations and technical discussions, both political and manufacturing licensing problems prevented a finalizing of any sales agreements. I returned the A/C to Eighth Army and flew back to Washington.

OV-1 B FLIGHT DELIVERY TO GERMANY

Prior to the initiation of the German and French evaluation programs, we in the Program Managers Office were working on a plan to flight ferry four (4) new production OV-1B aircraft to Germany in the late summer of 1963. All planning, to include flight crew selection was completed. In addition to myself who was designated flight leader, there were Captain, S D.R. Butler, W.C. McDermott and N.E. Williams, all of Fort Benning. Cold water survival training for the flight crews was conducted by the Air Force at Langley Field Va. and was completed without a problem.

Just as the flight was about to depart for Europe, the Cuban Missile crisis started. Consequently, the Air Force Air Rescue Service advised that they would not be able to provide over water air rescue support between New Foundland and the Azores and from the Azores to the coast of Portugal. Consequently, the mission was placed on hold till the international situation stabilized. Although the missile crisis lasted only a short time, the German and French evaluations deferred any further consideration for the ferry flight until sometime in 1964.

We did reconstitute the plan in March 1964. I was again designated as the flight leader. Early in the planning stage it was decided that there would be only one (1) pilot per A/C. This decision was based on several reasons (1) Should it be necessary to eject or crash land at sea, it would be less difficult to rescue one rather than two persons (2) the flight legs were relatively short (Max 5.5 hours) so a second pilot would be unnecessary.

We departed McGuire A.F. Base N.J. with four (4) fully functional OV-1B aircraft. Each A/C had two full 300 gal. external wing tanks plus 298 Gal. in the fuselage tank. With everything on board, the takeoff gross weight was near 16,000 lb. All legs of the trip were uneventful. Flying to Argentina New Foundland, Santa Maria in the Azores, Madrid Spain then to Sandhofen Germany. The trip only took three days. All systems were fully functional upon arrival so that after an Acceptance Inspection, the A/C were turned over to a Mohawk unit at Hanau.

This ends the early OV-1 history. By 1963 the aircraft had been issued world wide and was doing a great job performing a variety of missions.

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